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SOME PARASITES OF CATS IN KARACHI

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Abstract. Six parasites of cats commonly found in Karachi are described. These include an ectoparasite *Ctenocephalus felis* Stile and Colins, 1930; and five endoparasites *Dipylidium caninum* Linnaeus, 1958; *Dipylidium sexcoronatum* Ratz, 1900; *Taenia hydatigena hydatigena* n. sub sp.; *Toxascaris leonina* Raillet and Henery 1911; and *Echinochasums* sp. *Dipylidium sexcoronatum* is a new locallity record. The species identification of the trematode belonging to genus Echinohasums was not made due to unavailability of sufficient number of the specimens.

There is no record available in the literature about the ecto- and endoparsites of Pakistan specially from Sind region except a single recent description of *Opisthorchis felineus* Rivolta, 1884; Blanchard, 1895 from the intestine of cat in Karachi (Kaikabad, 1972). A variety of parasites of cat have been described from all over the world. A few species are also known from Lahore (*Taenia hydatigena* Pallas, 1766 *Taenia echinococcus* Zeder, 1803; Siebold, 1853; *Taenia pisiformis* Bloch, 1786; Gmdin, 1760; *Taenia multiceps* Leske, 1780; *Taenia pisiformis* Batsch, 1786; Wolffhugel, 1911; *Taenia serialis* Gervias, 1847; *Taenia ovis* Ransom, 1913; *Taenia gaigeri* Hall, 1916; *Dipylidium caninum* Linnaeus, 1758; *Dipylidium sexcoronatum* Ratz, 1900.[9]

Species from India are *D. catus* Culati, 1928; *Dipylidium sexcoronatum* Ratz, 1900, syn. of *D. caninum* Witenberg, 1932; *Taenia hydatigena* Pallas, 1766; *T. echinococcus* Zedar, 1803; Siebold, 1853; *T. pisiformis* Bloch, 1786; Gmdin, 1760; *Taenia multiceps* Leske, 1780; *Taenia taeniformis* Batsch, 1786; Wolffhugel, 1911, *T. serialis* Cervias, 1847; *T. ovis* Ransom, 1913.[1]

The nematodes of cats described from India are *Toxascaris leonina* Raillet and Henry, 1911; *Strongyloides felis* Chandler, 1925; *Psendaluis trichina* Davanine, 1863; *Ancylostoma caninum* Ercolani, 1859; *A. ceylancium* Looss, 1911; *Uncinaria felidis* Malpestone, 1939; *Subulurinae distans* Rud., 1809; *Toxocara mystax* Zeder, 1800; syn. *Ascaris cati* Schrank, 1788, e.p., *A. leptoptera* Rud., e.p., *A. microptera* Rud., 1819; *A. alata* Belingham, 1839; *Cylicospirura subaequalis* Molin, 1860; *Physaloptera fuelleborni* Mirza et Singh, 1934; P. *masoodi*, Mirza, 1934; *Chlamydonema felineum* Hegt, 1910; *Recticularia cahirensis* Jagerskiold, 1904; *R. rijobergi* Baylis, 1928; *Dirofilaria minor* Sandground, 1933.[11]

The Ectoparsites commonly reported from cat in India and other countries are *Ctenocephalides felis*;[5] *Ctenocephalus felis* Bouche;[9] *Ctenocephalides felis*, Bouche, 1835; Stiles and Collins, 1930; *Echinophage gallinacea* Westwood, 1875; Jordan and Rothschild, 1911.[2]

The trematodes from India listed in literature are, *Clonorchis sinensis* Cobbold, 1875; *Echinochasmus perfoliatus* Ratz, 1908; *E. canai* Chattergi, 1959; *E. begulai* Verma, 1935.

The cats are domesticated animals and remain in close contact with human beings and are also responsible for spreading certain infections among human being. These are also easily available, therefore, it is desirable to have information about the ecto- and endoparasites which are commonly found in them as no information is available from this locality.

The ecto- and endoparasites in cats of Karachi described here are: *Ctenocephalus felis* (Stiles and Collins, 1930; *Dipylidium caninum* Linnaeus, 1958; *Dipylidium sexcorouatum* Ratz, 1900; *Taenia hydatigena hydatigena* n. sub. sp., *Toxascaris leonina* Raillet and Henry, 1911, and *Echinochsamus* sp. Dietz, 1909.

Materials and Methods

The ectoparasites were collected from the hairs of 3 out of 12 cats examined and preserved in 70% alcohol. For preparation of permanent slides selected specimens were cleared by boiling in a solution of 10% KOH for 10 min then washed several times with water, dehydrated in graded alcohols, cleared in clove oil, and mounted permanently in Canada balsam. The nematodes were recovered from the intestine of 7 cats, which were preserved in 70% alcohol, cleared either in a mixture of equal quantity of glycerine and 70% alcohol or in lactophenol.

A total of 57 cestodes were recovered from 6 cats. The worms were relaxed in normal saline (NaCl 0.8%) for 30–60 min. The specimens were slightly pressed between two glass slides and fixed in F.A.A. solution (6 ml formalin–2.5 ml acetic acid–100 ml 50% alcohol) for 24 hr then washed with water to remove the fixatives stained with Mayer's carmalum, dehydrated in graded alcohols and mounted in Canada balsam.

Diagrams were made with camera lucida and measurements are given length by width in millimeters based on permanent preparations. Specimens are deposited in School of Parasitology, Department of Zoology, University of Karachi.

Ctenocephalus felis (Stiles and Collins, 1930) (Figs. 1–4)

Remarks. In all essential features the present ectoparasites are similar to the previous descriptions of *Catenocephalus felis* (Stiles and Collins, 1930).[3,5,6]

Dipylidium caninum (Linnaeus, 1758), (Figs. 5–11, Table 1)

Description

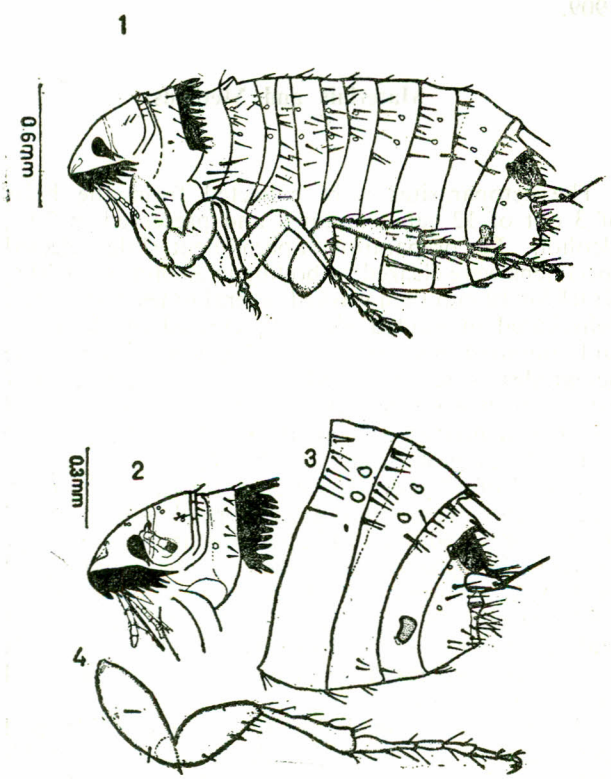
The scolex is 0.3–0.32 long, 0.440–0.441 wide, somewhat rounded in shape. Rostellum, oval usually retracted about 0.1–0.063 wide in the middle. There are four circulates of hooks which almost cover the entire portion of the rostellum. Hooks are rose-thorn shaped. Sukers are larger and ellipsoidal. Neck is short and thin.

The strobila is 150–200 long composed of 40–60 segments. The segments are at first very short and are followed by larger ones which become almost rectangular. The longest segments are about 6–7 long to 1 wide. Posterior to this point they become wider and shorter. The opening of the genital pore forms as a small protuberance on young segments, but in more mature segments it disappears and leaves instead a small depression which is at the anterior half of the lateral margin of the segment. The longitudinal excretory canals are very prominent even in young segments and are situated at the union of the adjacent segments. Gravid segment measures 5–6 long and 0.9–1.1 wide. The excretory canals runs along the margin of each segment. The uterine capsuls are 300–400 in number in each segment, a single capsule contains 2–15 eggs.

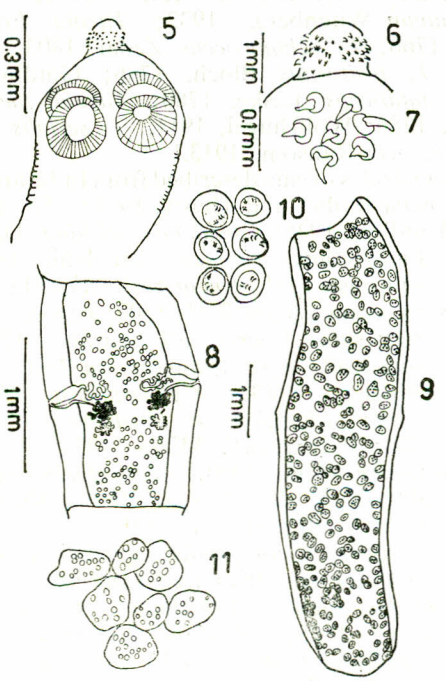
Male Genitalia. The testes are spherical about 140–150 in number in each segment and occupy nearly all the space between the longitudinal canals not occupied by other genital organs. The vasdeferens is much looped, it lies just anterior to the ovary and takes a straight course aside from the loop to the cirrus organ. In young segments the cirrus organs is almost flask-shaped. In mature segments it is tubular and measures 0.15–0.2 in length and 0.08–0.1 in width. It extends to the longitudinal excretory canals.

Female Genitalia. Each ovary consists of two distinct lobes each of which is irregularly branched 0.14–0.15 by 0.2–0.21 in size, lying posterior to the genital pores inside the longitudinal canals. Vitellarium is some distance posterior to the ovary and is irregularly spherical, loosely lobated, and smaller than the ovary. Shell gland is between the ovary and the vitellarium and does not form a receptacullum seminis. The oviduct is distinct. Each eggs capsule contains from 2 to 15 eggs, each egg is is about 0.05 in dia, with thin shells.

Remarks. Essentially the present species is similar to *D. canium* in morphology, therefore, is identified as *Dipylidium caninum.* There are slight variations in the length of the worm and the number of testes.[9]



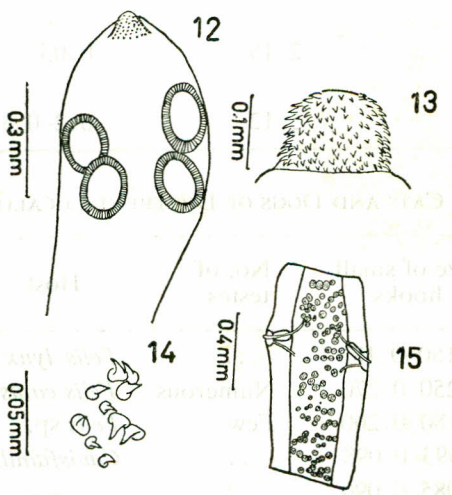
Figs. 1–4. *Ctenocephalus felis.* Stiles and Collins 1930. (1) Entire female, (2) magnified head region, (3) posterior region, (4) leg enlarged.

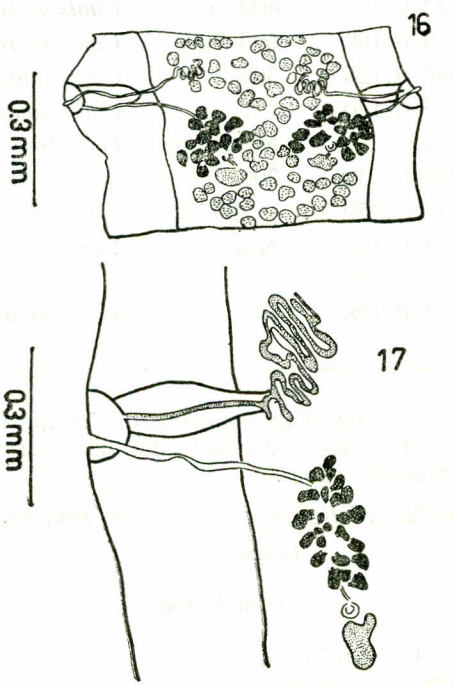


Figs. 5–11. *Dipylidium caninum* Linnaeus, 1958. (5) Scolex, (6) rostellum, (7) rostellar hooks, (8) mature proglottis, (9) gravid proglottis, (10) eggs, (11) egg capsules.

Dipylidium sexcoronatum (Ratz, 1900). (Figs. 12–21).

Remarks. This cestode is identified as *Dipylidium sexcoronatum* as it is more or less similar to this species in the rosteller hooks number of eggs, in each egg capsule and egg size, as well as in overall gross morphology. Although intraspecific variation are noticed in the morphology of the worm which are described here. Variation are noticed specially in the size, arrangement and structure of organs in mature segments. Variation in the mature segments of a single specimen are given below. (Figs. 18–21).



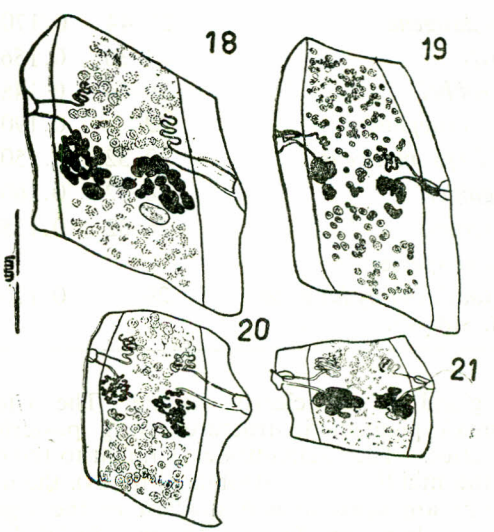


Figs. 12–17. *Dipylidium sexcoronatum.* Ratz, 1900. (12) Scolex, (13) rostellum, (14) rostellar hooks, (15) gravid proglottis, (16) mature segment, (17) terminal genitalia at higher magnification.

Some segments (Fig. 18) are almost rectangular, 1.18 long and 1.16 wide, with large spherical testes scattered throughout the segment. The genital pore is in the middle of the segment and the cirrus sac and vagina open at the same level. The ovary lie just below the equator of the segment. The shell gland not clearly visible. The vitellaria are large compact organs. 0.11 long by 0.17. The right vitellaria is larger than the left. Vasdeferens in loops directed towards the anterior portion of the segment.

Other segments (Fig. 19) are longer than broad, about 2 long and 1.12 wide, testes are numerous and shown an almost blurred outline. The vasdeferens is looped and lies apart from the anterior portion of the ovary. The ovary consist of two lobes, which are irregularly lobate elongated structures lying at the level of genital pore. The vitellaria are smaller than either of the two portions of each ovary and are likewise irregular, situated just posterior to the ovaries. The small shell gland is distinct between the ovary and vitellarium. The opening of the vagina is immediately behind that of the cirrus pouch.

In more posterior mature region (Fig. 20) the segment is rectangular but smaller than the abovementioned segments, about 1.50 long by 1.1 wide. The testes are large, irregular structure fewer in number and are uniformly distributed throughout the medium field not crossing the longitudinal excretory canal. The genital pore is anterior half of the segment. The vasdeferens is moderately looped anteriorly. The ovary consists of several small lobes lying in the middle of the segment. The



Figs. 18–21. Intraspecific variation in *Dipylidium sexcoronatum* in size of segments and arrangement of organs. (18) Mature proglottis with large spherical ovarian follicles (18 in number approx) and spherical vitellaria, (19) mature proglottis, much larger than wide, small ovarian spherical follicles (27 in number approx) and irregular vitellaria, (20) mature proglottis slightly larger than wide, irregular ovarian follicles (20 in number approx) irregular vitellaria, (21) mature proglottis sligthly broader tham long with 4–6 larva ovarian follicles and relatively small vitellaria.

TABLE 1. MEASUREMENTS OF *Dipylidium* SP. IN CATS OF DIFFERENT LOCALITIES.

Species	Length of the worm (mm)	No. of rows of hooks on rostellum	No. of eggs in each egg capsule	Diameter of eggs (mm)
D. trinchesei	25	4 circlets	1	
D. pasqualei	200–300	16 ,,	1	
D. chyzeri	120–200	13–14	1	0.052–0.53
D. sexcoronatum	100–235	6	2–15	0.021
D. oerleyi	50–110	5	Egg lie in groups	0.025
D. caninum	150–400	3–4	5–20	0.043–0.05
Present species I				
D. caninum	150–200	4	2–15	0.05
Present species II				
D. sexcoronatum	160	9–10	5–12	0.2–0.3

TABLE 2. COMPARATIVE MEASUREMENTS OF *Taenia* SP. FROM CATS AND DOGS OF DIFFERENT LOCALITIES.

Species	No. of hooks	Size of large hooks	Size of small hooks	No. of testes	Host
Taenia laticollis	38–66	0.380–0.420	0.150–0.183	..	*Felis lynx*
T. taeniformis	26–52	0.380–0.420	0.250–0.270	Numerous	*Felis catus*
T. macrocytis	60–74	0.320–0.365	0.180–0.200	Few	*Felis* sp.
T. balaniceps	28–32	0.145	0.093–0.098	..	*Canisfamiliaris*
T. brauni	30	0.130–0.140	0.085–0.090	..	—
T. brachyosoma	30–32	0.135–0.140	0.095–0.105	..	*Canis familiaris*
T. pisiformis	34–38	0.225–0.294	0.132–0.177	400–500	*Canis & felis* sp.
T. hydatigena	22–44	0.170–0.220	0.110–0.160	600–700	*Canis & felis* sp.
T. ovis	24–36	0.156–0.188	0.096–0.128	300	*Canis familiaris*
T. krabbei	26–34	0.148–0.170	0.085–0.120	..	*Canis familiaris*
T. monostephanos	29	0.190–0.210	..	Moderate	*Felis lynx*
Multiceps multiceps	22–32	0.150–0.170	0.090–0.130	200	*Canis familiaris*
M. gaigeri	28–32	0.160–0.180	0.115–0.150	200–225	*Canis familiaris*
M. serialis	26–32	0.135–0.176	0.112–0.128	Numerous	*Canis familiaris*
Present species					
T. hydatigena hydatigena n. sub sp.	29	0.176–0.192	0.112–0.128	195	*Felis domestica*

shell gland is not clearly visibile. The vitellaria are small pigmented structures lying posterior to the ovaries. The vagina passes straight to the ovary.

In the middle of the strobila (Fig. 24), the mature segments are squarish and smallest of the segments described above measuring 1.15 long by 0.9. The testes are distributed throughout the field and are mostly irregular in outline. The vasdeferens is much looped lying in the anterior of the segment and apart from the ovary. The genital pore in anterior part of the segment and the cirrus sac is pyriform in shape. Each ovary consists of four large lobes which are arranged irregularly, occupying a space 0.25×0.3. The two sets of the ovary lie in the middle of the segment, shell gland is conspicuous. The vagina curves posteriorly after crossing the excretory canal.

Taenia hydatigena hydatigena **n. sub. sq.**

(Figs. 22–26).

Description

Scolex 0.8 dia and more or less pyriform in shape. Rostellum prominent bearing a double crown of 29 hooks. The large hooks are 0.176–0.192 in length. The blade is of slight curvature, the handle is long straight and club-shaped and the guard

in lateral view is rounded and smooth. The smaller hooks are 0.112–0.128 long with a blade, almost straight and more or less pointed and longer than the handle. The guard is conically rounded distally. The handle is short and broader than in the larger hooks. The suckers are rounded and have a maximum breadth of 0.286–0.288 and 0.301–0.304 in length. Neck is prominent, narrow and 0.03 in length. The entire strobila measures from 0.130 to 0.340 and consists of 54–59 mature segments and 150–166 immature segments. The anterior segments are very short, the following are cuneiform and the terminal are elongated. Mature segments wider than long 0.520–0.448 wide and 0.232–0.395 long. Immature segments are numerous and smaller than mature segments.

Male Genitalia. There are about 200 testes in each segment oval or spherical in shape and are set close together in lateral portions of the medium field of the segment close to the excretory canal. The testes also extend along the sides of the ovaries but do not lie close to them and do not pass posterior to the vitellarium. The vasdeferens is slightly looped elongaed and apparently originates at some distance from median stem of the uterus on the pore side of the segment. The cirrus pouch is cylindrical 0.368–0.320 long and 0.144 wide.

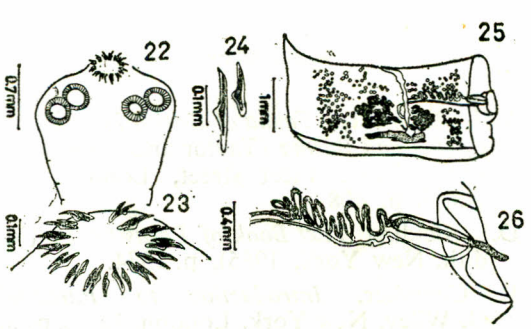
Female Genitalia. The ovaries consist of irregular lobes and are uuequal in size. The vitellarium is elongated along the transverse axis of the segment. It is lobated and extends across the posterior portion of the interovarian field. The shell gland is large and lie between the vitellarium and ovary. The vagina extends in from the genital pore almost straight or somewhat inclined anteriorly and curves around nearest the ovary passing through the uterus and forming a receptaculum seminis in the interovarian field.

Remarks. The present specimens cannot be included in any of the known species of the genus *Taenia* because of variation in the length of the worm, number of testes and variations in the size of the hooks. It resembles more to *Taenia hydatigena* than other species of the genus. The mature segments of the present species resemble with *T. taeniformis* except that in the latter ovary and vitellaria are compact but in the former ovary and vitellaria are lobated. The number and size of hooks of the present species are within the range of the size of the hooks of *T. hydatigena* but the number of testes in the present species are closer to those of *T. multiceps*. As the hook size of the present species are more or less similar to those of *T. hydatigena*, it is more close to this than other species. Although the present specimens show variations from *T. hydatigena*7 in the number of testes, shape of mature segments, structure of ovary. Therefore, present specimens are regarded a new subspecies of *T. hydatigena*.

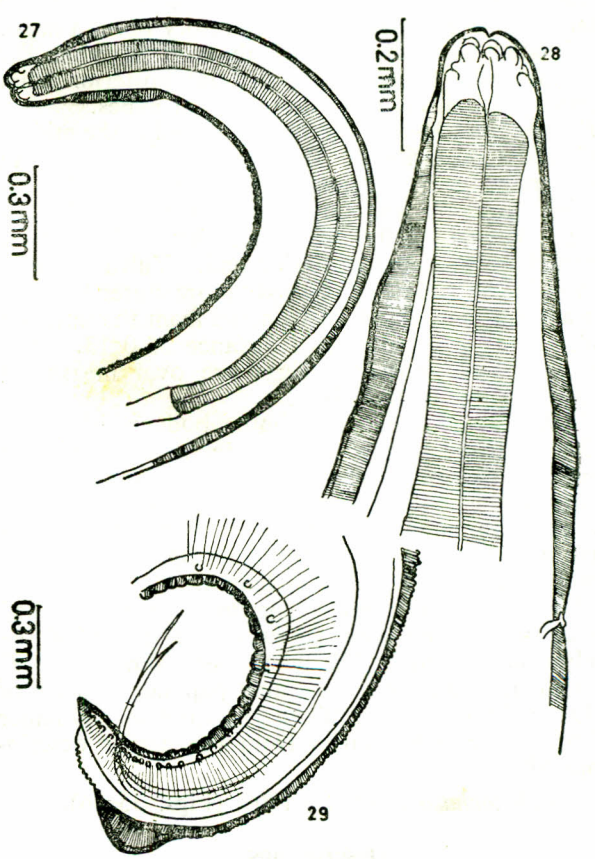
Toxascaris leonina (V. Linst, 1902) Raillet and Henry, 1911 (Figs. 27–34).

Description

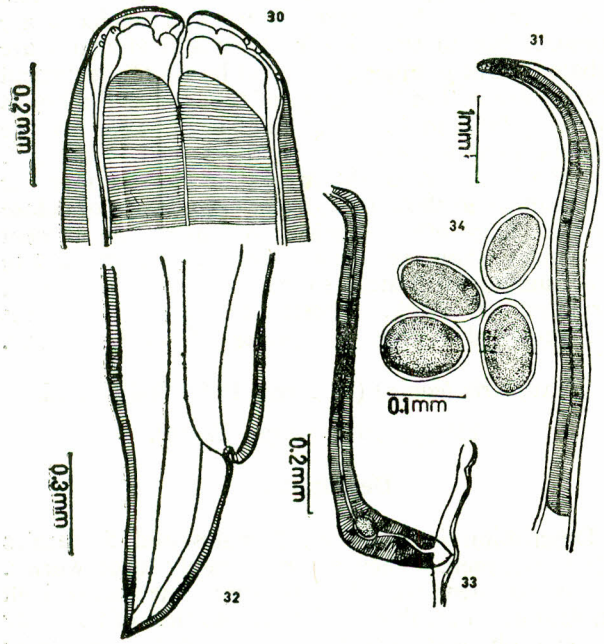
Description is based on 3 males and 5 females adult specimen. They are moderately large worms. Fresh specimens are yellow turning somewhat whitish on fixation in alcohol–glycerine. Cuticle of the body is smooth, transversely striated. Body gradually attenuated towards both ends. Mouth bounded by three well-developed lips, 3 pairs of papillae are



Figs. 22–26. *Taenia hydatigena hydatigena* **n. sub sq.** (22) Scolex, (23) rostellum, (24) rostellar hooks. (25) mature proglottis, (26) terminal genitalia at higher magnification.



Figs. 27–29. *Toxascaris leonina*, male, (V. Linst, 1902) Raillet and Henry, 1911. (27) Anterior portion, (28) head region, (29) posterior portion.



Figs. 30–34. *Toxascaris leonina*, female, (V. Linst, 1902) Raillet and Henery, 1911. (30) Head region, (31) anterior portion, (32) posterior portion, (33) region of vulva, (34) eggs.

visibile on each lip. The cervical alae as well as lateral alae are present. The excretory pore in males is situated at a distance of about 0.52 from the anterior end. Esophagus is without posterior bulb. Females viviparous much longer than males.

Female. long 30–80. The body is broad in the middle and tapers posteriorly. The cervical alae are long and narrow and decrease gradually in width in hinder part of the body. Esophagus 1.57–2.18 long. Vagina 1.0–1.65 long by 0.08 wide, directed towards the posterior end. Vulva situated almost in the middle of the body more closer towards the anterior end about 10.08 apart from the anterior end. Anus is situated at a distance of 0.13. The tail is sharply pointed. Eggs are oval measuring 0.09–0.15 by 0.07–0.08.

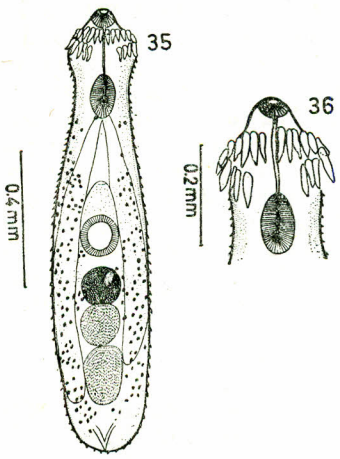
Male. 27–35 long. Maximum body width 0.36-0.39, relatively slander than female. Cervical also long and narrow decreasing gradually towards the posterior end. Esophagus is 2.5–3.6 long. Tail conical with cuticular striations. There are 5 post-anal and 18–20 preanal papillae. Spicules are unequal measuring 2.5–3.3 in length.

Remarks. The present specimens are identified *Toxascaris leonina* with variations in length of the body and spicule. The characters similar to *T. leonina* are number of postanal papillae, position of vulva and the presence of the cerivcal alae. Number of preanal papillae varies from the earlier descriptions.[1,8]

Echinochasmus Dietz, 1909, (Figs. 35–36).

Descriptions

Based on one complete specimen. Body spinose, elongated, 0.93 long and 0.29 wide. Body spinose



Figs. 35–36. *Echinochasmus* sp. Dietz, 1909. (35) *Echinochasmus* sp. (ventral aview), (36) anterior of the same.

more numerous anteriorly. Head collar strongly developed, reniform, with a single row of 21 spind oral sucker visible, approximately 0.03 dia. Pharynx prominent 0.14 long, 0.05 wide. Esophagus 0.2 long. Ceca subequal reaching to near posterior extremity, terminating at the level of testes. Acetabulum well apart from the oral sucker, larger in size situated almost in the middle of the body measuring 0.096 dia. Testes are placed obliquely in the posterior half of the body, spherical to oval in shape anterior 0.11 by 0.11 in size, while the posterior 0.128 by 0.112 in size. Cirrus pouch almost entirely anterior to the acetabulum.

Ovary median, posttesticular, preacetabular, spherical 0.11 dia. Vitellaria occuying the greater part of the lateral fields of the hind body and slightly intruduing into the forebody. Excretory vesical feebly visible, Y-shaped.

Remarks. Essentially the present specimen agrees with the genus *Echinochasmus* Dietz, 1909. The presence of a single row of interrupted 21 oral spines, spines on the entire body, acetabulum far apart from the oral sucker. Vitellaria commencing at the level of acetabulum, serves to designate the present specimen in the genus *Echinochasmus*. Species indentified is not made as only one specimen was avilable.

References

1. A.H. Baylis, *The Fauna of British India including Ceylon and Burma* (Taylor and Francis, Red Lion Court, Fleet street, London, 1936), vol. I, p. 408.
2. D.L. Belding, *Text Book of Parasitology* (Meredith, New York, 1965), p. 1374.
3. R. Chandler, *Introduction to Parasitology* (J. Wiley, New York, London, 1961), p. 661.
4. M.C. Hall, Proc. U.S. Nat. Mus., **55,** 1(1916).
5. G. Lapage, *Veterinary Parasitology* (Oliver and Boyd, London, 1956), p. 964.

6. S.W. Patton, *A Text Book of Medical Entomology*, Christian Literature Society for India, London, Madras and Calcutta (1913), p. 764.

7. T. Southwell, *The Fauna of British India including Ceylon and Burma* (Taylor and Francis, London, 1930), vol. I, p. 391.

8. S. Yamaguti, *Systema Helminthum* (Interscience, New York, 1961), vol. III, p. 1261.

9. S. Yamaguti, *Systema Helminthum* (Interscience, New York, 1959), vol. II, p. 860.

10. S. Yamaguti, *Systema Helminthum* (Interscience, New York, 1958), vol. I, p. 1575.